



# California Regional Water Quality Control Board

## San Francisco Bay Regional Water Quality Control Board

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**TO:** Al Wright  
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**Wildlife Conservation Board**

**FROM:** Steve Moore  
**SAN FRANCISCO BAY REGIONAL**  
**WATER QUALITY CONTROL BOARD**

**DATE:** January 9, 2003

**SUBJECT: Review of Data from Cargill Salt Ponds, South San Francisco Bay**

This memorandum provides initial answers to questions the WCB has posed with respect to the potential purchase of former salt ponds from Cargill Salt. The answers provided do not represent the Board's final decision, but rather a first-cut response from knowledgeable senior staff.

Analytical results from studies conducted by the U.S. Fish and Wildlife Service (USFWS), City of San Jose, Santa Clara Valley Water District (SCVWD), and Cargill Salt have been sent to our office.

Staff is not surprised by the analytical results, and continues to support the purchase of ponds to enhance long-term water quality of the bay. But water quality challenges exist to convert the system from salt making to circulating bay waters, and ultimately to wetlands. South San Francisco Bay is strongly influenced by the legacy of large scale mercury mining from 1850-1962, with a gradient of mercury in sediments leading from the Golden Gate down South Bay and up the Guadalupe River drainage. In the Alviso area, available aerial maps suggest salt ponds were not constructed until after World War I, allowing decades for untreated mercury to settle into areas that are now salt ponds. The mines were in the Guadalupe River drainage, whose delta spread across the Alviso pond area (from A3W on the west to A17 on the east). The bay's sediments near Alviso Slough tend to be 0.8-1.2 mg/kg, above the bay's average of 0.43 mg/kg. The pond sediments near Alviso Slough are in the same range. Available data suggest the salt making operation has not concentrated mercury in sediments above levels in adjacent bay waters.

Salt making concentrates bay pollutants proportionately with salinity. Therefore higher salinity ponds contain certain pollutants, such as copper, nickel, and mercury, in excess of water quality objectives for the bay. These pollutants can be discharged back to the bay as long as flow rates are not too large to create zones in the bay that exceed water quality objectives. The rule of thumb of maintaining bay salinities below ocean salinity (35 ppt) should maintain attainment of water quality standards.

Dynamic modeling has suggested that the initial release of salty waters from ponds over 50 parts per thousand (50 ppt) will cause short-term exceedances of water quality objectives for copper and mercury, and perhaps nickel. Salinity modeling suggests that these exceedances will be localized (a few acres) and the duration limited (2 weeks to 2 months). Board staff could argue to the Regional Board that these exceedances are allowable based on the long term environmental benefit and public interest.

The bay's ecosystem is already exposed to the mercury in the salt ponds. Invertebrates and fish that live in the ponds accumulate mercury and resident and migratory birds ingest these organisms. From a global perspective, connecting the ponds hydrologically with the bay is not expected to increase the overall exposure of organisms to mercury. But changing chemistry and biology of the medium salinity ponds (50-150 parts per thousand) may affect mercury cycling in ways that should be investigated in a monitoring program, so that impacts are minimized.

Baumberg ponds do not appear to have pollutant issues like Alviso, related to mercury mining, urban runoff and wastewater discharges, and the low flushing environment of the bay south of Dumbarton Bridge. Baumberg ponds are to be managed by the state. The highest mercury levels are in ponds where the Refuge already owns the land, and Cargill owns the salt making rights.

**DO THE WATER AND SEDIMENT SAMPLES INDICATE ANY HAZARDOUS OR TOXIC SUBSTANCES IN THE PONDS THAT MAY REQUIRE CLEANUP?**

If cleanup is defined as physically removing the material and hauling it to landfills, no. The water and sediment samples that we reviewed did not indicate toxic substances present in hazardous concentrations.

Of all the substances analyzed, only mercury exhibited ecologically significant concentrations in sediments. The distribution of mercury in sediments is patchy, based on uneven deposition patterns of mineral mercury over the last two centuries. Of 102 samples, the highest observed sediment mercury concentration in the ponds, 1.92 mg/kg, is significantly below the hazardous concentration of 20 mg/kg, a threshold at which physical removal of sediments could be considered. For creation of wetlands, however, the Regional Board's sediment guideline of 0.71 mg/kg for mercury, based on NOAA's effects-range-median (ERM) concentration, is exceeded in about 10% of the 102 samples reviewed. Regional Board staff believes that the mercury levels in the ponds warrant attention in how these ponds are managed during the restoration phase of the project.

Proposed interim management measures are needed to "cleanup" accumulated brines due to the salt pond operation. Interim management activities such as water structure construction, circulation of bay waters in and out of ponds, monitoring of bay waters downstream of

discharges, and minor adjustments to discharge flowrates will be necessary to assimilate the pond waters into the bay and meet water quality standards. Toxic substances are present in the pond waters and sediments; the only substances of concern appear to be metals. Metals in waters are concentrated more-or-less proportionately with bay salts. Metals in sediments are at levels similar to the bay, often lower than the bay. No organic pollutants have been detected in sediments at levels above ambient bay sediments. Organic pollutants have not been detected in pond waters at levels of concern.

Available data confirm that no pollutants have been added to the ponds by the salt making operation.

**ARE THE METAL LEVELS ELEVATED? IF SO, WHERE? HOW WOULD THESE LEVELS IMPACT THE BOARD'S ABILITY TO ISSUE A DISCHARGE PERMIT?**

Toxic substances like nickel and mercury are present in some of the pond waters at levels that exceed water quality objectives, in ponds above 50 parts per thousand salinity. Based on April 2002 pond salinity data, that equates to about half the ponds (12 out of 25).

As in the North Bay ponds, metals in sediments tend to be lower in pond sediments than in the adjacent bay sediments. Relative to the rest of the Bay, mercury in sediments are elevated in ponds along Alviso and Guadalupe Sloughs, but the levels are within the range of concentrations in the adjacent sloughs, so salt making has not exacerbated the existing water quality issue. We will probably have to limit discharges to below 50 ppt, and perhaps nearer ocean salinity of 35 ppt, to keep copper, nickel and mercury levels within water quality objectives.

**HOW WOULD THE ELEVATED MERCURY LEVELS AT ALVISO AFFECT LONG-TERM RESTORATION AND NOT INTERIM MANAGEMENT?**

Mercury can be methylated (made bioavailable) in wetlands, increasing risk of accumulation in the bay's food chain. It can also be demethylated (non-bioavailable) in similar environments. The restoration plan needs to minimize the methylation of mercury, and a variety of options exist which will be influenced by restoration scenarios. Alternatives for careful management of Alviso Ponds near Alviso Slough must be characterized to minimize the concentration of mercury in the bay's food chain. Circulating bay water in the interim plan should not exacerbate the issue, and may benefit the situation by keeping water and associated organisms moving through the system and incrementally reducing exposure to sediments.

**ANYTHING IN THESE SAMPLES RAISE RED FLAGS FOR THE BOARD? IF SO,**

**WHAT ARE THESE RED FLAGS AND HOW DO YOU SUGGEST WE THE PARTIES (AGENCIES OR CARGILL) DEAL WITH THEM TO ALLOW DISCHARGE PERMITS TO BE ISSUED FOR ALL AREAS?**

Thanks to the dynamic modeling efforts, we are convinced that we can manage the brines that are in the ponds, with some short term exceedances that are outweighed by the long term benefits. As such, the information we have reviewed does not raise red flags, but perhaps yellow flags of caution, particularly regarding mercury in sediments and tissue. If Cargill retains pond waters above 150 parts per thousand in their system for salt harvesting, as they have proposed, then we should be able to issue discharge permits for all the areas of the project.

Mercury has long term restoration implications for ponds near Alviso and Guadalupe Sloughs. The jacksmelt fish in Pond A9 (mouth of Alviso Slough) had mercury much higher in their tissue than Pond A1 (near Mtn. View) or the rest of the bay. This observation poses an interesting set of questions about entraining fish into ponds where they cannot return to the bay and thereby lower their exposure to mercury in sediments. Jacksmelt tend to roam all over the bay and not reside in one slough or embayment. The proposed interim management measures to move bay water in and out of the ponds should have a benefit of affording entrained fish the opportunity to return to the bay. It seems reasonable that this change in how the ponds are operated will reduce this bioaccumulation impact that was discovered through sampling conducted by the U.S. Fish and Wildlife Service.

During interim management, the ponds should be operated to minimize methylation of mercury in sediments, to the extent practicable. At this point in time, management measures to minimize methylation have not been well defined by the scientific or resource agency communities. Therefore, the agencies will need to conduct mercury methylation studies as a condition of the discharge permit, so that they can adaptively manage the ponds and demonstrate that they have done everything possible to minimize the adverse effects of the South Bay mining legacy.